

## Ulnar Collateral Ligament Reconstruction

### Surgical Indications and Considerations

*Anatomical Considerations:* The ulnar collateral ligament complex consists of three ligaments including the anterior oblique, posterior oblique, and transverse ligament. The anterior oblique originates at the medial epicondyle and inserts into the medial coronoid process. The anterior oblique ligament is considered the primary stabilizer of the elbow to valgus stress during the throwing motion and is the most commonly injured portion.

*Pathogenesis:* The anterior bundle of the ulnar collateral ligament is the primary restraint to valgus force stress during the late cocking and acceleration phases of throwing. During these phases the tensile force placed on the anterior bundle exceeds its restraining capabilities. Repeated valgus stress results in a degenerative process of the ulnar collateral ligament with eventual increased laxity and medial instability. In this sense, overuse is the primary cause of ulnar collateral ligament injury. Often a single episode during the throwing motion will cause the final insult or tear. However, an underlying degenerative process is the primary pathology. Laxity of the ulnar collateral ligament results in overuse injuries of the dynamic stabilizers of the elbow secondary to compensatory mechanisms. These injuries include pronator and flexor mass tendinopathy. The instability of the ulnar collateral ligament will cause abnormal force and subsequent symptoms to other elbow structures including the radiocapitellar compartment, posteromedial olecranon, medial epicondyle, and ulnar nerve.

*Epidemiology:* Ulnar collateral ligament injuries occur primarily in overhead athletes such as baseball players, javelin throwers, quarterbacks, tennis players, and water polo players. These athletes are subjected to valgus force at the medial elbow during the throwing motion, which is the primary cause of ulnar collateral ligament injuries. Other athletes subjected to medial valgus stress include wrestlers, gymnasts, and hockey players.

### *Diagnosis*

- Differential diagnosis is usually difficult due to the fact that ulnar collateral ligament injuries have an underlying degenerative process that predispose the patient to concomitant symptoms of flexor and pronator mass tendinopathy, ulnar neuritis, and symptoms consistent with loose bodies in the elbow
- Most pain is felt during the acceleration phase of throwing and at the point of ball release
- Some patients will describe a “giving way” feeling after a throwing motion and will be unable to continue throwing thereafter (considered the final insult to a degenerative process)
- Point tenderness two centimeters distal to the medial epicondyle
- Pain and instability with a valgus stress test (humerus stabilized with elbow at thirty degrees flexion). This test may also produce numbness and tingling in the ulnar nerve distribution because the excess medial gapping at the elbow will stretch the ulnar nerve

- Several types of valgus stress tests are described in the current literature with different positions of the humerus. Note that compensatory humeral torsion deformities are believed to occur with throwing athletes which may alter the examiners view of relative glenohumeral range of motion
- Imaging studies and arthroscopy have proven helpful with diagnosis of ulnar collateral ligament injuries. However, due to variability of ulnar collateral ligament laxity associated with symptomatic versus asymptomatic elbow pain, physical examination and patient history remain as the primary means of diagnosis.

*Nonoperative Versus Operative Management:* Nonoperative management has yielded acceptable results in the non-throwing athletic population. Nonoperative rehabilitation starts with a period of active rest, which consists of cessation of throwing while focusing on strengthening of the rotator cuff and shoulder girdle. Once elbow pain resolves, a strengthening program of the pronator and flexor musculature is initiated. If elbow pain remains controlled and shoulder mechanics are satisfactory, an interval-throwing program is employed. Surgical reconstruction versus repair is recommended for any patient wishing to return to throwing activities. Both non-surgical rehabilitation and postoperative repairs have shown a high incidence of valgus laxity in follow-up studies when compared to reconstruction procedures. Ulnar collateral reconstruction has proven effective in several patient populations including high level throwing athletes.

*Surgical Procedure:* The most current and accepted procedure is a modification of the original technique described by Jobe et al. This current method elevates the flexor-pronator muscle mass from the elbow without detachment and utilizes subcutaneous rather than sub muscular ulnar nerve transposition. Several types of tendon grafts have been used to reconstruct the ulnar collateral ligament including the gracilis, plantaris, and toe extensor tendons. Currently the palmaris longus is the graft of choice and the most commonly used tendon for reconstruction. The graft is woven in a figure eight fashion through bone tunnels at the medial ulna and humerus. The elbow is then placed in ninety degrees of flexion and splinted for one week after surgery for soft tissue healing.

#### *Preoperative Rehabilitation*

- Cessation of throwing program
- Focus towards controlling symptoms at the elbow
- Initiate a shoulder girdle strength and stabilization program including rotator cuff strengthening
- Flexor and pronator mass strengthening initiated if elbow pain is controlled
- Educate and familiarize patient to post-operative rehabilitation

## POSTOPERATIVE REHABILITATION

Note: The following rehabilitation progression is a summary of the guidelines provided by Andrews, Hurd, and Wilk. Refer to their publication to obtain further information regarding criteria to progress from one phase to the next, anticipated impairments and functional limitations, interventions, goals, and rationales.

### **Phase I for Immobilization and Rehabilitation:** Weeks 1-3

Goals: Protect surgical site

Improve tolerance to elbow range of motion

Control pain and edema

Improve upper extremity strength and muscle contraction

Improve active wrist range of motion

Intervention:

- Posterior splint with 90 degrees elbow flexion for 1-2 weeks replaced by hinged brace at 30 to 100 degrees
- At 3 weeks progress brace to 15 to 115 degrees
- Rest, ice, compression, and elevation
- Submaximal shoulder isometrics
- At 2 weeks begin wrist flexion and extension

### **Phase II for Mobilization and Rehabilitation:** Weeks 4-8

Goals: Elbow active range of motion 0-145 degrees

Protect elbow from valgus force

Increase functional strength of upper extremity

Improve tolerance to active range of motion

Intervention:

- Elbow brace set at 10-120 degrees and increased by 5 degrees extension and 10 degrees flexion per week
- Isotonic exercise (1-2 pounds) for wrist flexion/extension, forearm pronation/supination, elbow flexion/extension, and rotator cuff exercises except internal rotation
- At 6 weeks: brace set at 0-130 degrees and add shoulder internal rotation exercises

**Phase III for Mobilization and Rehabilitation:** Weeks 9-13

Goals: Increase muscular control of upper extremity

Prepare for return to previous activities

Allow patient to self manage symptoms and gradually return to activities

Sport specific training

Intervention:

- Continue exercises in phase I and phase II
- Begin plyometric exercises in throwing position
- Initiate eccentric elbow flexion/extension exercises
- Proprioceptive neuromuscular facilitation patterns
- Light sporting activities (golf and swimming)
- Rotator cuff, shoulder girdle stabilization, and shoulder active range of motion isotonics
- Elbow flexion/extension exercises
- Forearm pronation/supination exercises
- Wrist flexion/extension exercises

**Phase IV for Mobilization and Rehabilitation:** Weeks 14-26

Goals: Symmetric upper extremity strength

Gradual return to unrestricted sport and throwing

Intervention:

- Interval warm up throwing program at 60 to 180 feet with two sessions of 25 throws at each distance with a 10-minute rest between each session
- Fastball only throwing program starting at 15 throws off a mound at 50% and increasing the number of throws by 15 until reaching 60 throws
- Fastball only throwing program with the above progression at 75%
- Fastball progression as above with initiation of breaking pitches at 50%
- Work up to simulated game progression and limit breaking pitches to 25% of total throws
- Return to competitive level at 22 to 28 weeks

### Selected References:

Azar F, Andrews J, Wilk K, Groh D. Operative treatment of ulnar collateral ligament injuries of the elbow in athletes. *Am J Sports Med.* 2000;28:16-23.

Andrews J, Hurd W, Wilk K. Reconstruction of the Ulnar Collateral Ligament with Ulnar Nerve Transposition. In Maxey L, Magnusson J, eds., *Rehabilitation for the Postsurgical Orthopedic Patient*. St. Louis, MO: Mosby; 2001.

Cain E, Dugas J, Wolf R, Andrews J. Elbow injuries in throwing athletes: a current concepts review. *Am J Sports Med.* 2003; 31:621-634.

Safran M. Injury to the ulnar collateral ligament: diagnosis and treatment. *Sports Med Arthrosc.* 2003;11:15-24.

Rettig C, Colin S, Snead S, Mendler C, Mieling P. Nonoperative treatment of ulnar collateral ligament injuries in throwing athletes. *Am J Sports Med.* 2001;29:15-17.

Timmerman L, Andrews J. Histology and arthroscopic anatomy of the ulnar collateral ligament of the elbow. *Am J Sports Med.* 1994;22:667-673.